Russian Journal of Physical Chemistry A 2002 vol.76 N12, pages 2051-2057

Sorption of water vapor and acetonitrile by human serum albumin

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Abstract

The adsorption of water and acetonitrile (AN) vapor on a human serum albumin (HSA) from water-acetonitrile mixtures was measured by IR spectroscopy at 298 K in the water activity range from 0 to 0.98. It was established that the ability of the protein to bind water markedly decreases in the presence of acetonitrile. The dry protein sorbs ~180 mol AN/mol HSA. The amount of AN sorbed linearly decreases with increasing humidity of the protein. An analysis of the absorption band belonging to the stretching vibration of the nitrile group of AN suggests that the environment of sorbed AN molecules changes from predominantly peptide to predominantly aqueous. The degree of helicity of proteins significantly increases in the presence of vapors of organic compounds. For the desorption branch, the difference in the degrees of helicity of a protein that sorbed pure water and a water-acetonitrile (AN) mixture (excess helicity) depends on the humidity, linearly increasing in passing from pure water to pure acetonitrile. During subsequent sorption-desorption cycles when the water is completely removed without removing AN, the excess helicity is independent of what branch is used, being determined only by the amount of AN in the protein sample.